REMARKS

The above amendments to the above-captioned application along with the following remarks are being submitted as a supplemental response to the Official Action dated June 30, 2004, in conjunction with the response filed December 7, 2004. In view of the above amendments and the following remarks, the Examiner is respectfully requested to give due reconsideration to this application, to indicate the allowability of the claims, and to pass this case to issue.

Status of the Claims

As set forth in the response filed December 7, 2004, claims 2-3, 5-6, 8-11, 13-14, 16-17 and 19-22 are under consideration in this application. Claims 1, 4, 7, 12, 15 and 18 were cancelled without prejudice or disclaimer. Claims 2-3 were amended, as set forth in the above marked-up presentation of the claim amendments, in order to more particularly define and distinctly claim applicants' invention. New claims 21-22 were added to recite other embodiments described in the specification. All the amendments to the claims are supported by the specification. Applicants hereby submit that no new matter is being introduced into the application through the submission of this supplemental response.

Prior Art Rejections

Claims 1, 4, 12, 15 and 18 were rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Pat. App. Pub. No. 2003/0235717 of Veerdonk et al. (hereinafter "Veerdonk"), and claims 2-3, 5-11, 13-14, 16-17 and 19-20 were rejected under 35 U.S.C. § 102(e) or under § 103(a) as being unpatentable over Veerdonk. The prior art reference of Coffey et al. (2002/0098381), Chen et al. (6,753,072), and Litvinov et al. (6,656,613) were cited as being pertinent to the present application. These rejections have been carefully considered, but are most respectfully traversed.

The perpendicular magnetic recording medium of the invention, as now recited in claim 2, including a substrate and a magnetic layer formed on the substrate, said magnetic layer comprising multilayer superlattice films of ferromagnetic metal layers which contain Co and paramagnetic metal layers which consist of Pd and/or Pt. The multiplayer superlattice films of ferromagnetic metal layers are formed by sputtering deposition so controlled that a product (P_O * D_{TS}) of a sputtering gas pressure P_O and a distance D_{TS} between the substrate

and target areas for forming said multiplayer superlattice films of ferromagnetic metal layers is 20 Pa*cm or more ("*to suppress the temperature-dependent change of Ku effective*" p. 17, 1st paragraph; thereby "*suppressing temperature-dependent change of Hc*" p. 16, line 10). A rate of decrease in coercivity of said magnetic layer, if exposed to extreme temperature change, is less than 0.15 when said rate is evaluated by a formula: [H_c at 25 degrees Celsius – H_c at 70 degrees Celsius]/H_c at 25 degrees Celsius, where H_c is the coercivity of said magnetic layer.

The invention, as now recited in claim 13, is also directed to a perpendicular magnetic recording medium including a substrate and a magnetic layer formed on the substrate, said magnetic layer comprising multilayer superlattice films of ferromagnetic metal layers which contain Co and paramagnetic metal layers which consist of Pd and/or Pt, said multiplayer superlattice films of ferromagnetic metal layers are formed by sputtering deposition so controlled that a product (P_O * D_{TS}) of a sputtering gas pressure P_O and a distance D_{TS} between the substrate and target areas for forming said multiplayer superlattice films of ferromagnetic metal layers is 20 Pa*cm or more. When a magnetic torque loop of said perpendicular magnetic recording medium is measured with a torque magnetometer, the polarity of a value of loop components with translational symmetry of 90 degrees is opposite to the polarity of a value of loop components with translational symmetry of 180 degrees.

As discussed in the previous response, in the prior art, the magnetic moment in noble metal atoms is unstable, while according to the present invention, the magnetic moment in noble metal atoms into the multiplayer superlattice films of ferromagnetic metal layers is stable, due to the unique sputtering requirement (P_O * D_{TS}) $\geq$ 20 Pa*cm.

Applicants respectfully contend that none of the cited references teaches or suggests "such multiplayer superlattice films of ferromagnetic metal layers being formed by sputtering deposition so controlled that a product (P_O * D_{TS}) of a sputtering gas pressure P_O and a distance D_{TS} between the substrate and target areas for forming said multiplayer superlattice films of ferromagnetic metal layers is 20 Pa*cm or more" so as to provide (1) the rate of decrease in coercivity of the multiplayer superlattice films of ferromagnetic metal layers is less than 0.15 (claim 2); and (2) when a magnetic torque loop of the perpendicular magnetic recording medium is measured with a torque magnetometer, the polarity of a value of loop components with translational symmetry of 90 degrees is opposite to the polarity of a value of loop components with translational symmetry of 180 degrees as the invention (claim 3).

In particular, Applicants will point out that the results of (1) the rate of decrease in

coercivity of the multiplayer superlattice films of ferromagnetic metal layers is less than 0.15 (claim 2); and (2) when a magnetic torque loop of the perpendicular magnetic recording medium is measured with a torque magnetometer, the polarity of a value of loop components with translational symmetry of 90 degrees is opposite to the polarity of a value of loop components with translational symmetry of 180 degrees as in the invention (claim 3), were provided by the unique sputtering requirement $(P_O * D_{TS}) \geqq 20$ Pa*cm of the invention, and not achievable in the prior art structure as asserted by the Examiner.

According to the present invention, when the multiplayer superlattice films of ferromagnetic metal layers are formed by sputtering deposition so controlled the product (P_O * D_{TS}) of sputtering gas pressure P_O and the distance D_{TS} between the substrate and the targets is controlled to be 20 Pa*cm or more, sputter particles jetted from the targets collide with the gas repeatedly in the chamber eventually settle on the substrate surface such that their kinetic energy is less. The magnetic moment induced in noble metal atoms in the superlattice so-formed is stable even if being positioned away from the interface between the ferromagnetic metal layer and the noble metal layer, since the noble metal atoms are exactly arranged in an intended crystalline structure (p. 18, line 27 to p 19, line 5).

As noted above, the magnetic moment in noble metal atoms is unstable, while according to the present invention, the magnetic moment in noble metal atoms into the multiplayer superlattice films of ferromagnetic metal layers is stable, due to the unique sputtering requirement $(P_O * D_{TS}) \geqq 20$ Pa*cm.

Accordingly, the perpendicular magnetic anisotropy energy Ku does not change with extreme temperature change, and the rate of decrease in coercivity of the multiplayer superlattice films of ferromagnetic metal layers is less than 0.15 (claim 2), and when a magnetic torque loop of the perpendicular magnetic recording medium is measured with a torque magnetometer, the polarity of a value of loop components with translational symmetry of 90 degrees is opposite to the polarity of a value of loop components with translational symmetry of 180 degrees (claim 3).

As such, the present invention as now claimed in independent claims 2-3 is distinguishable and thereby allowable over the rejections raised in the Office Action. The withdrawal of the outstanding prior art rejections is in order, and is respectfully solicited.

Conclusion

In view of all the above, clear and distinct differences as discussed exist between the present invention as now claimed and the prior art reference upon which the rejections in the Office Action rely, Applicant respectfully contends that the prior art references cannot anticipate the present invention or render the present invention obvious. Rather, the present invention as a whole is distinguishable, and thereby allowable over the prior art.

Favorable reconsideration of this application is respectfully solicited. Should there be any outstanding issues requiring discussion that would further the prosecution and allowance of the above-captioned application, the Examiner is invited to contact the Applicants' undersigned representative at the address and phone number indicated below.

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